Issue Paper
(2/1/2008 Draft)

Stewardship of the Watershed Boundary Dataset (WBD)

Introduction: Federal agencies working with their state partners have been coordinating spatial water data over the past several years under the charter of the Federal Interagency Subcommittee on Spatial Water Data (SSWD). The Subcommittee on Spatial Water Data is jointly sponsored by the Advisory Committee on Water Information (ACWI) and the Federal Geographic Data Committee (FGDC). The SSWD has promoted development of the Watershed Boundary Dataset (WBD) for inclusion in the National Spatial Data Infrastructure (NSDI).

The resulting WBD provides a nationally consistent, seamless, and hierarchical hydrologic unit boundary dataset based on topographic, hydrologic features, and local level information. This dataset at 1:24,000 scale resolution includes two additional subdivisions, Watersheds (5th level, 10-digit hydrologic units) and Subwatersheds (6th level, 12-digit hydrologic units).

There is broad agreement among state WBD user communities that an effective stewardship strategy is needed in order to adequately protect their return on investment for this dataset. Stewardship will provide the mechanism to correct errors and incorporate enhancements with the involvement of local land managers. Stewardship also facilitates individual and collective user needs while decreasing the possibility of multiple and divergent datasets representing the same area. Describing the pressing need and recommended approach for this stewardship strategy is the purpose of this issue paper.

Issue Description: A comprehensive WBD Stewardship Strategic Plan that addresses all pertinent issues needs to be developed as soon as possible. This should be accomplished in collaboration between the Natural Resources Conservation Service (NRCS), the U.S. Geological Survey (USGS), and their state and federal partners across the nation.

Background: State and federal groups have committed extensive resources toward the development of the WBD. The USGS and NRCS have partnered with these groups to ensure development of an accurate and hydrologically sound data layer that incorporates input from all cooperators. The NRCS certification project is well underway across the nation with anticipated completion by the end of FY2008. WBD datasets for some states have already met the national certification requirement and entered a maintenance phase without any comprehensive strategy to guide the stewardship activities.

The edit and review process associated with WBD certification results in a migration of the legacy 1:250,000 scale Subbasin (4^{th} level, 8-digit hydrologic units) dataset to 1:24,000 scale, as well as incorporation of Watersheds and Subwatersheds, also at 1:24,000 scale. It is anticipated that additional refinements will be identified as users continue to work with the dataset. The availability of higher resolution sources (eg. LIDAR) will also result in extensive improvements to existing boundaries. As a result, there is considerable interest by state WBD user communities to actively engage their stewardship responsibility for the WBD.

Developing a stewardship strategy for a nationally served dataset such as the WBD presents a number of challenges. Fortunately, there is an existing model, the stewardship model for the National Hydrography Dataset (NHD), which can serve as a guide for developing this strategy. Key components of the NHD example include the following:

1) The creation of a nationwide partnership to produce and maintain a single source for the dataset.
2) The community of users becomes the primary stewards of the dataset.
3) The national steward (USGS in the NHD case) facilitates the stewardship process.
4) The state stewards/users improve the dataset through time by identifying enhancements, correcting identified errors, and providing quality control.
5) The national steward provides project oversight, management, and quality assurance to ensure continued data integrity and consistency across the nation. Stewardship Agreements established between the national and state stewards formalize these roles and responsibilities.

Problem Statements and Recommendations:

While the main issue that is to be addressed in this paper is the Post-Certification Stewardship of the WBD dataset, there are several major sub-issues that are integral elements needing specific attention. Each of these five issues are discussed below as individual problem statements and recommendations.

1. There is no comprehensive post-certification stewardship strategy in place for the WBD.
2. Stewardship roles and responsibilities have not been identified for the WBD.
3. The stewardship relationship between the WBD and NHD has not been defined
4. Hydrologic Unit boundary delineations at the 7th and 8th level have not been addressed in the national WBD guidelines.
5. No process workflow has been identified for update/maintenance of the WBD.

1. There is no comprehensive post-certification stewardship strategy in place for the WBD.
Significant effort over a number of years has gone into the development of the WBD. NRCS and USGS are now hosting completed datasets which have met certification requirements. Passing certification does not ensure 100% data accuracy/quality and it is anticipated that significant modifications will be needed in some locations based on improved local knowledge and/or new data sources.

A mechanism needs to be in place so that the WBD can be effectively edited, updated and served to the user community following a consistent approach. With out this, multiple and divergent datasets that meet individual, regional or local objectives are likely to be developed. This would decrease any return on investments in and benefits from a single, shared and authoritative WBD.

Recommendation:

- Develop a Strategic Plan for WBD Stewardship. This Plan should be developed collaboratively with the state WBD stewardship community.
- The Plan should to be developed on a fast track since it must be in place as state datasets pass national certification. Additionally, there is an opportunity to take advantage of the current interest and momentum from the WBD certification effort, as well as the considerable background and knowledge of the experienced WBD developers before they are tasked to other efforts.

2. Stewardship roles and responsibilities have not been identified for the WBD. An effective stewardship strategy requires a clear understanding of roles and responsibilities. Currently, these are not well understood for the WBD. The NHD stewardship experience

indicates that stewardship roles and responsibilities need to be clearly defined and agreed-upon at all levels. This ensures effective interaction between national and state stewards.

NRCS and USGS have both provided project management and other support to the initial delineation and certification of the WBD. National stewardship roles for both agencies have not been well defined.

Recommendation:

- Work collaboratively with the state stewards to establish clear definitions for stewardship roles and responsibilities. Primary stewardship responsibility should reside at the State Steward level due to the fact that these in-state groups have on-the-ground knowledge, are more likely to identify deficiencies, and are also most impacted by changes to the boundaries. State, local and regional representation needs to be involved regarding changes, refinements or additions to national guidelines. Recommended roles and responsibilities include the following:

    - State Stewards:
      Provide primary dataset maintenance.
      Provide technical support and education regarding use, access, and application of the data set.
      Serve as single Point of Contact to NRCS/USGS.
      Coordinate and approve all edits.
      Perform edit transactions on national repository.
      Provide QC and resolve data conflicts.
      Collaborate with NRCS/USGS on national edits.
      Collaborate with adjacent states.
      Collaborate with in-state Framework efforts.
      Promote vertical integration with NHD.
      Manage state-specific attribution separate from the WBD standard data structure.

    - National Steward: (NRCS/USGS)
      Provide program leadership and management.
      Provide standards and continuity.
      Involve ALL interested cooperators with regard to guidelines and any plans for significant changes affecting the dataset.
      Provide effective mechanisms for discussion of stewardship topics (eg. teleconferences, web sites, regional or state meetings, discussion forums).
      Maintain data model.
      Provide guidance and training.
      Perform centralized edit transactions.
      Provide official portals to serve certified data to user community.
      Provide liaison and coordination with national interagency oversight committees.
      Provide forum for proposal, discussion, and reaching agreement on WBD standards issues.
      Host and/or provide information on applications developed for the WBD.

- Establish WBD stewardship agreements between State and National WBD Stewards in new WBD Agreements, new combined NHD/WBD Agreements, or by adding WBD stewardship components as an addendum to existing NHD Stewardship Agreements.
- Specifics of the WBD stewardship strategy may vary from state to state. This strategy formalizes the approach that is appropriate to be taken for any given state.
- Develop and provide template for WBD Stewardship Agreements to promote consistency across states.

3. The stewardship relationship between the WBD and NHD has not been defined. The WBD and NHD are closely related and modification to one of the datasets often precipitates a change to the other. The stewardship relationship between the two is currently undefined as there is no strategy in place for the WBD and both datasets are managed separately. These factors add complexity to keeping the two datasets in synch.

Recommendation:

- Address the relationship between the WBD and NHD as follows:
    - There should be a linkage between stewardship of both datasets. This should be addressed when stewardship agreements are developed. These agreements should include strong language regarding the requirements for vertical integration. Processes and dependencies should be developed that facilitate vertical integration.
    - An additional strategy should be developed that will lead to database designs that include both NHD and WBD. This will reduce the complexity of keeping both datasets in synch.

4. Hydrologic Unit boundary delineations at the 7^{th} and 8^{th} level have not been addressed in the national WBD guidelines. Many state and federal agencies are delineating 7^{th} and 8^{th} level boundaries to meet project level requirements. Currently, there is no national direction or protocol to guide their development and incorporation into the national seamless WBD. While there are relatively few of these delineations across the nation, there should be a mechanism to account for them within the WBD process.

Recommendation:

- Work with each participating state to develop national guidelines for the delineation of 7^{th} and 8^{th} level hydrologic unit boundaries.
- Expand the WBD data standard to include attribution associated with these subdivisions.
- Population of 7^{th} and 8^{th} level subdivisions is optional and based on specific in-state needs.
- Provide mechanism for appropriate level of review of these 7^{th} and 8^{th} level subdivisions.

5. No process workflow has been identified for update/maintenance of the WBD. The NRCS currently has an informal process in place for accepting post-certification changes to the WBD. This process has not been formalized or provided to the WBD stewardship community.

Recommendation:

- Develop a comprehensive edit process workflow that accounts for agreed-upon roles and responsibilities, national and state steward business requirements, and user expectations.

This workflow will describe how the stewardship community updates the WBD in the national repository.

- The specifics of implementing this edit process workflow may vary state by state. Specific requirements will be described in individual WBD Stewardship Agreements.
- The following workflow is recommended:

1. A WBD user identifies an error or other necessary modification to the dataset.
2. The user submits a change request to the State WBD Steward accompanied by proper documentation
3. The State WBD Steward coordinates the suggested change(s) with all affected in-state stewards, adjoining state stewards, and other interested parties.
4. The State WBD Steward accepts or rejects the requested change based on state and national WBD delineation standards within an agreed-upon timeframe.
5. If the change request is accepted the edit is performed through an edit transaction upon the national dataset.
6. The accepted update is submitted to the National WBD Steward.
7. The National WBD Steward performs basic data quality assurance, accepts or rejects the submittal, and posts successful submittals to the national repository within an agreed-upon timeframe. Rejected submittals are referred back to the State Steward.
8. The National WBD Steward notifies the State WBD Steward and the WBD User Community that an update has occurred for a particular 4^{th}, 5^{th} or 6^{th} level hydrologic unit.

Benefits: There are a number of benefits for both state and national stakeholders that will be realized through formalizing a WBD Stewardship Strategic Plan.

Benefits to State WBD Stakeholders:

- Provides mechanism for local user community to request review and correction of identified errors in a timely manner.
- Relies on State Steward and in-state partners who possess local knowledge of landscape issues.
- Provides local ability to accept or deny requested changes to dataset.
- Provides standards and guidance for delineating 7^{th} and 8^{th} level boundaries.
- Improves the accuracy and usability of the dataset

Benefits to National WBD Stakeholders:

- Provides WBD National Stewards with program oversight and control.
- Relieves National WBD Stewards of responsibility for local editing and review.
- WBD modifications that are submitted to the National WBD Steward have been determined, by the State WBD Steward, to be acceptable candidates for Certification.
- Relieves the National WBD Steward's burden of edge-matching collaboration with adjacent states.

Summary: A broad spectrum of state and regional WBD stewards and users participated in the development of this Issue Paper. State, federal, and regional stewardship groups were involved and the resulting Issue Paper represents their collective input on a comprehensive WBD Stewardship Strategy. It is also the view of this group that this Strategy, including these

approaches, should be implemented as soon as possible. This will protect the shared investment in this important national Watershed Boundary Dataset.

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Glossary of Terms:

Hydrologic Unit (HU) - A hydrologic unit is a drainage area delineated to nest in a multilevel, hierarchical drainage system. Its boundaries are defined by hydrographic and topographic criteria that delineate an area of land upstream from a specific point on a river, stream or similar surface waters. A hydrologic unit can accept surface water directly from upstream drainage areas, and indirectly from associated surface areas such as remnant, non-contributing, and diversions to form a drainage area with single or multiple outlet points. Hydrologic units are only synonymous with classic watersheds when their boundaries include all the source area contributing surface water to a single defined outlet point.

LIDAR (*Light Detection and Ranging*) - An optical remote sensing technology that measures properties of scattered light to find range and/or other information of a distant target. The prevalent method to determine distance to an object or surface is to use laser pulses. Like the similar radar technology, which uses radio waves instead of light, the range to an object is determined by measuring the time delay between transmission of a pulse and detection of the reflected signal.

National Hydrography Dataset - A comprehensive set of digital spatial data that encodes information about naturally occurring and constructed bodies of water, paths through which water flows, and related entities. The information encoded about these features includes classification and other characteristics, delineation, geographic name, position and related measures, a "reach code" through which other information can be related to the NHD, and the direction of water flow. In addition to this geographic

information, the dataset contains metadata and information that supports the exchange of future updates and improvements to the data.

Subwatershed - Subdivisions within Watersheds. Subwatershed is the sixth level (12-digit) in the WBD hydrologic unit hierarchy. Subwatersheds generally range in size from 10,000 to 40,000 acres.

Watershed - Subdivisions within a Subbasins. The 5th level (10-digit) in the WBD hydrologic unit hierarchy. Watersheds range in size from 40,000 to 250,000 acres.

Watershed Boundary Dataset - A national, consistent, seamless, and hierarchical hydrologic unit dataset based on topographic and hydrologic features across the country. This WBD at 1:24,000 scale is digital geographic data that includes two additional levels of detailed hydrologic unit boundaries nested within existing or modified 1:250,000-scale hydrologic units, Watersheds (5^{th} level, 10-digit hydrologic units) and Subwatersheds (6^{th} level, 12-digit hydrologic units). The WBD when completed will provide a consistent framework for local, regional, and national needs in States, Tribal Lands, Pacific Islands, Puerto Rico, and the U.S. Virgin Islands.